

## State Water Resources Control Board

June 19, 2018

Kenneth A. Harris Jr., State Oil & Gas Supervisor  
Department of Conservation  
Division of Oil, Gas & Geothermal Resources  
801 K Street, MS 18-05  
Sacramento, CA 95814-3530  
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### PRELIMINARY CONCURRENCE ON THE PROPOSED AQUIFER EXEMPTION, MIDWAY SUNSET OIL FIELD, KERN COUNTY

Dear Mr. Harris:

State Water Resources Control Board (State Water Board) staff, in consultation with Central Valley Regional Water Quality Control Board staff (collectively Water Boards staff), have reviewed the aquifer exemption proposal provided by the Division of Oil, Gas and Geothermal Resources (DOGGR) on May 25, 2018 for the Midway Sunset (MWSS) Oil Field. The proposal seeks to expand the aquifer exemption for the Tulare B zone of the Tulare Formation, Potter Sands, Spellacy Sands, Miocene Shales, and Antelope Sands within the MWSS Oil Field for Class II injection.

Water Boards staff assessed whether the proposal meets the criteria set forth in California Public Resources Code (PRC) section (§) 3131 and § 146.4 of Title 40 of the Code of Federal Regulations (CFR). Pending the results of the public comment process, State Water Board staff preliminarily concur with the exemption proposal for the Potter Sands, Spellacy Sands, Miocene Shales, and Antelope Sands (concurrence area). State Water Board staff make no decision regarding the proposal for the Tulare B zone of Tulare Formation at this time. In conjunction with the evaluation of current and future underground injection control (UIC) projects in the concurrence area, DOGGR and Water Boards staff will consider incorporating conditions into project approvals.

### State and Federal Exemption Criteria

As required by PRC § 3131(a)(1) and 40 CFR § 146.4(a), the concurrence area does not currently serve as sources of drinking water. No water supply wells were identified as being completed within the concurrence area. Water supply wells identified in proximity to the concurrence area are all completed in the undifferentiated alluvium/Tulare A zone. In the area of these supply wells, the undifferentiated alluvium/Tulare A zone is vertically separated from

the shallowest formation at issue (Spellacy Formation) by approximately 2,500 to 6,000 feet and multiple vertical confining layers.

Consistent with 40 CFR § 146.4(c), the concurrence area contains groundwater with concentrations of total dissolved solids (TDS) between 3,000 and 10,000 milligrams per liter (mg/L) and is not reasonably expected to supply a public water system due to the presence of hydrocarbons and/or elevated concentrations of other constituents, such as total dissolved solids. In addition, as per PRC § 3131(a)(2), the injected fluids are not expected to affect the quality of water that is, or may reasonably be, used for any beneficial use because (1) the groundwater contained in the concurrence area is not expected to be put to beneficial use because it contains petroleum hydrocarbons and also contains constituents such as boron and total dissolved solids at concentrations that limit its suitability for agricultural, domestic, and other beneficial uses, and (2) the injected fluids are expected to remain in the concurrence area.

The requirement of PRC § 3131(a)(3) is also satisfied because the injected fluids are expected to remain within the concurrence area due to the following geologic and hydraulic conditions:

#### **Potter Sands**

The concurrence area is separated into the North Midway-Sunset (NMWSS) and Midway Valley expansion areas (Figure 1). Fluids injected in the western portion of the concurrence area (the green EOR (enhanced oil recovery) area in Figure 1) will be laterally contained by a production-induced inward hydraulic gradient.

In the NMWSS area, the Potter Sands are laterally contained to the west by the McKittrick Thrust Fault (Figures 1 and 2). Lateral containment to the north, northeast, east, and southeast is provided by a pinch-out of the Potter Sands into the low permeability Reef Ridge Shale. In the Midway Valley area, the Potter Sands are laterally contained to the southwest and west by their erosional outcrop at the surface (Figures 1, 2, and 3).

The Potter Sands are vertically contained below by the Reef Ridge Shale. Low permeability shales in the basal San Joaquin/Etchegoin Formation and the basal Tulare Formation overlie (unconformably) the Potter Sands, restricting vertical fluid migration (Figures 2 and 3).

#### **Spellacy Sands**

The concurrence area includes a northern hydrocarbon bearing EOR area and a larger southern EOR expansion area (Figure 4). Fluids injected in the concurrence area will be laterally contained by a production-induced inward-directed hydraulic gradient.

For the northern area, vertical containment of the Spellacy Sands is provided above and below by the deep marine Miocene Shales. For the southern area, vertical containment is provided above by the low permeability shales in the basal San Joaquin/Etchegoin Formation and below by the Miocene Shales. The Spellacy Sands are laterally contained to the east by a pinch-out into the Miocene Shales and to the west by a production-induced inward-hydraulic gradient (Figure 5).

#### **Miocene Shales**

The concurrence area includes the North Midway-Sunset and Central Midway-Sunset expansion areas (Figure 6). The Miocene Shales are truncated above by the regional Pliocene-Miocene

unconformity which provides vertical containment. The Tulare and San Joaquin/ Etchegoin Formations overlie the Pliocene-Miocene unconformity and provide additional vertical containment. The interbedded silts and shales restrict fluid migration both vertically and laterally. The presence of viscous, heavy oil further restricts fluid migration.

### **Lower Antelope Sands**

The Lower Antelope Sands are contained both vertically and laterally by the low permeability Miocene Shales (Figure 5).

### **Conditions on Injection Projects**

Approval of Class II UIC projects involves a joint review by DOGGR and Water Boards staff. DOGGR and Water Boards staff will consider incorporating conditions into approvals of Class II injection projects. Potential conditions include, but are not limited to, requiring monitoring to confirm that injected fluids remain in the concurrence area. If a monitoring requirement is incorporated in a UIC project approval, the operator must submit a work plan to the Central Valley Regional Water Quality Control Board for consideration.

If you have any questions regarding this matter, please contact Mr. John Borkovich at (916) 341-5779 or [john.borkovich@waterboards.ca.gov](mailto:john.borkovich@waterboards.ca.gov).

Sincerely,



Jonathan Bishop  
Chief Deputy Director

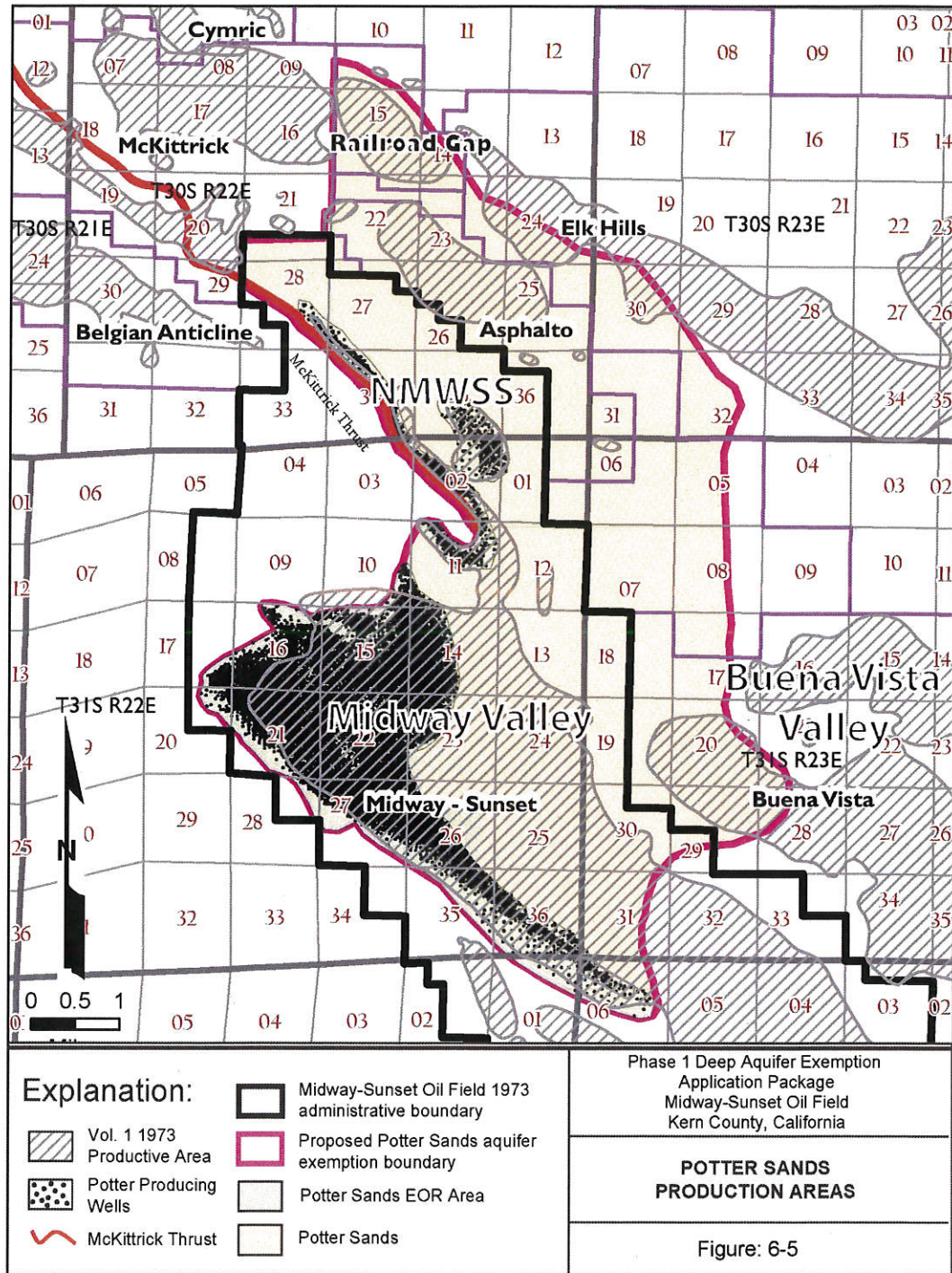
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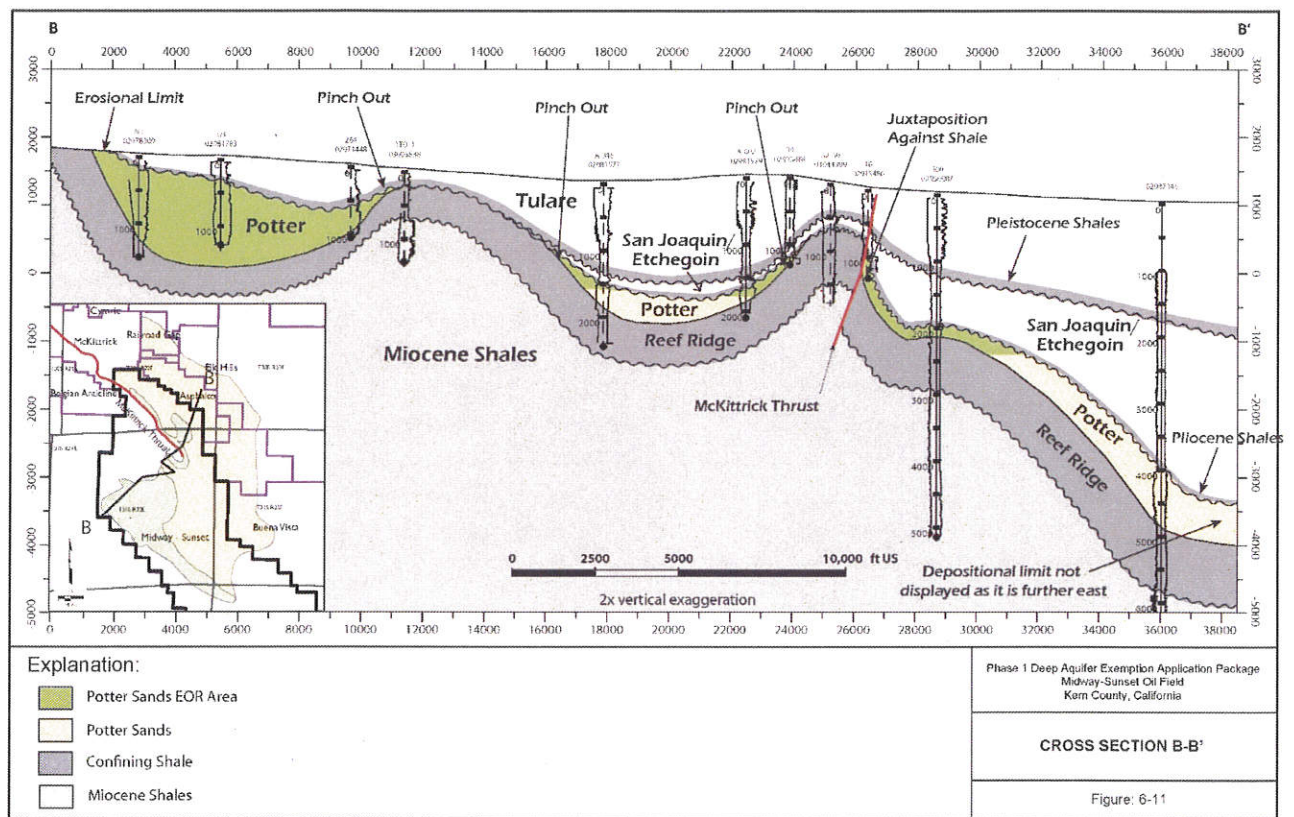
# Enclosure

Figure 1



Proposed Potter Sands Aquifer Exemption Boundary (Figure 6-5 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

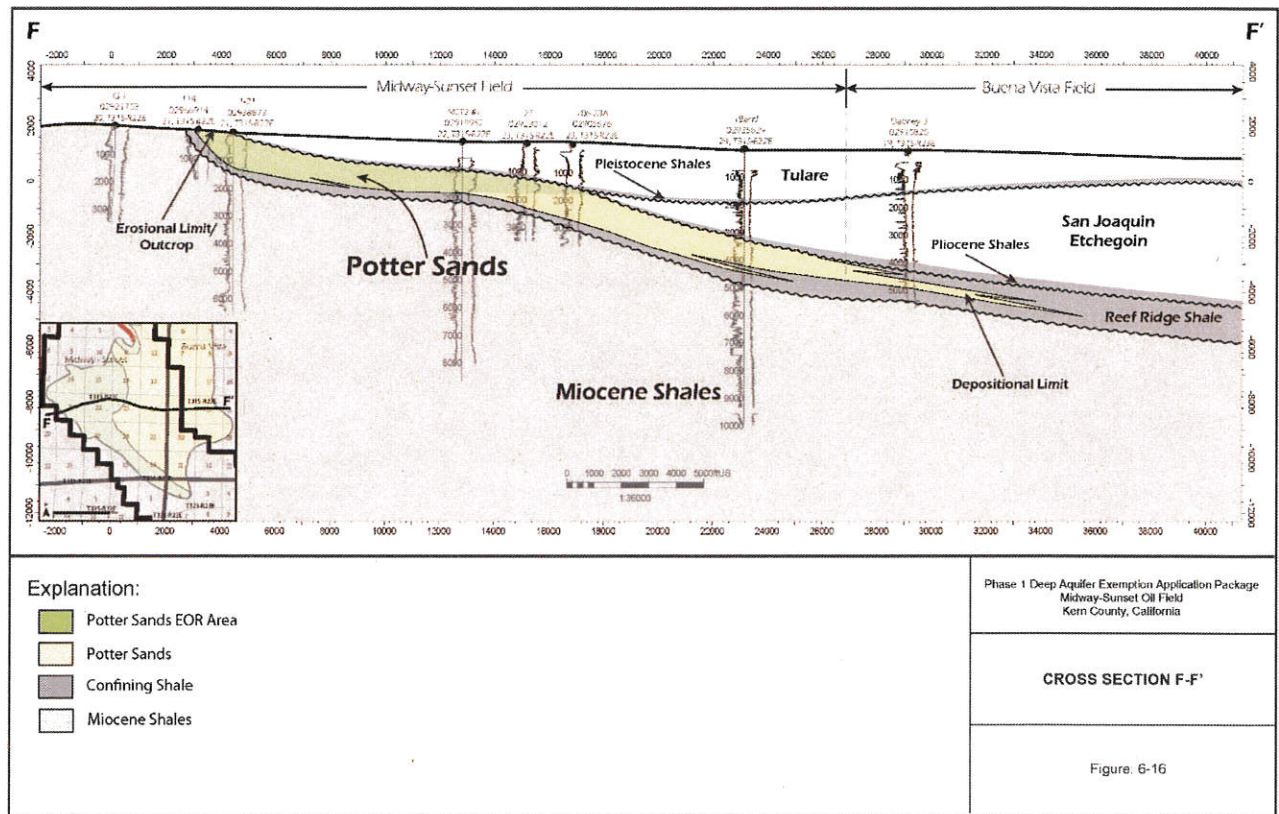
**Figure 2**



Cross-section B-B' (Figure 6-11 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

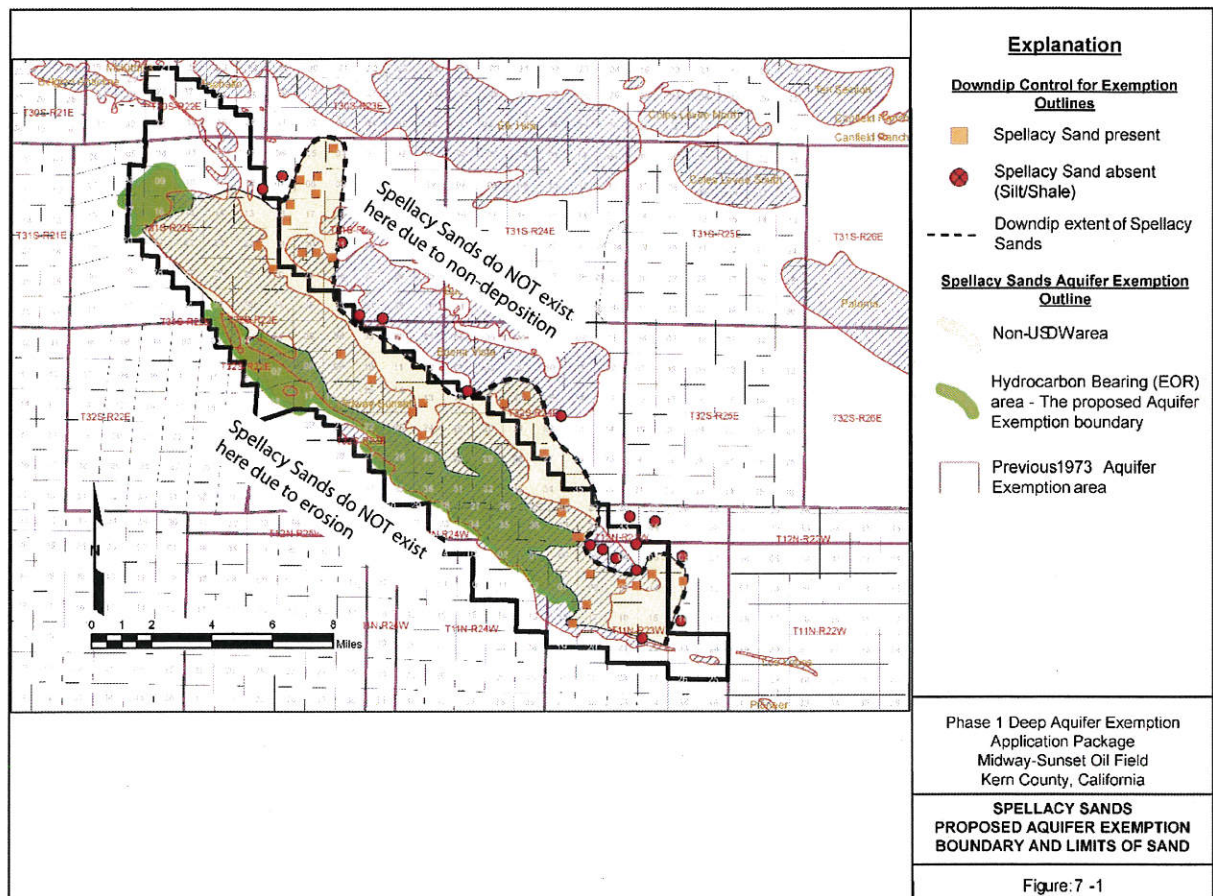


Figure 3



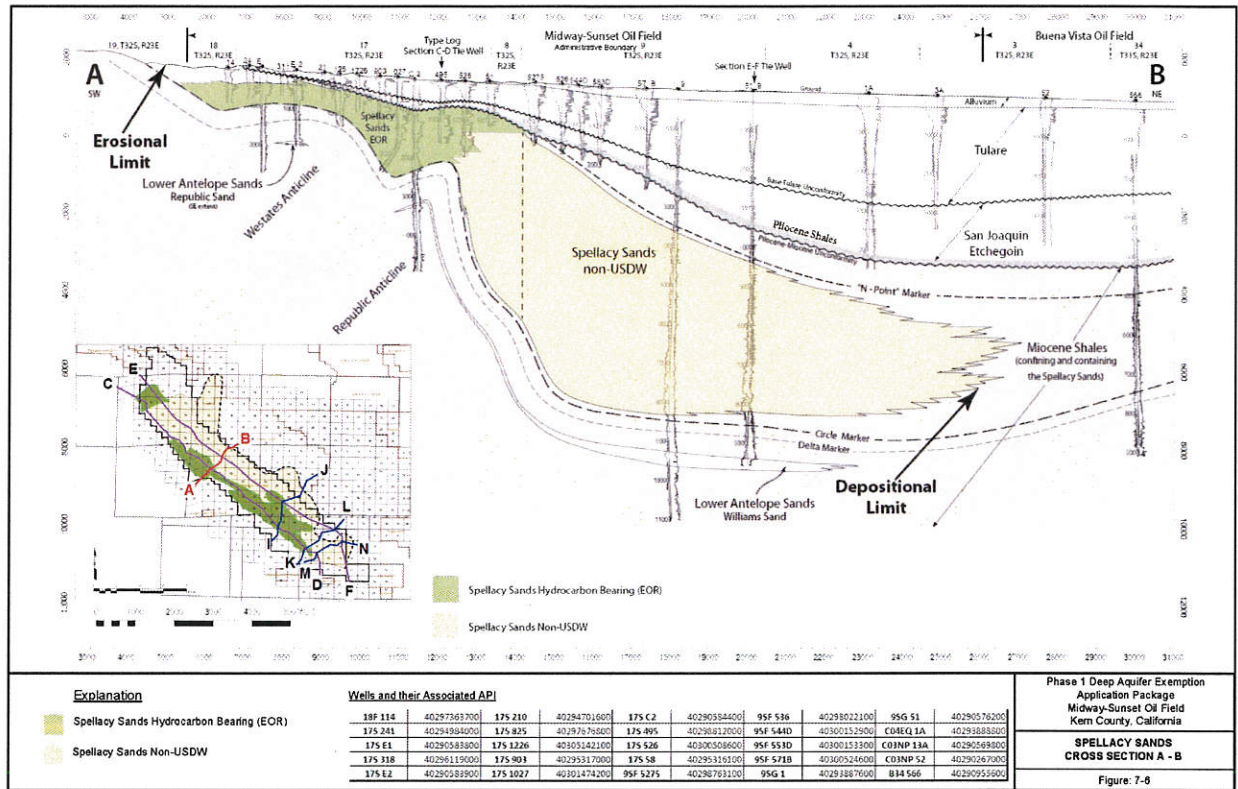
Cross-section F-F' (Figure 6-16 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

Figure 4



Proposed Spellacy Sands Aquifer Exemption Boundary (Figure 7-1 of the revised figures),  
Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.

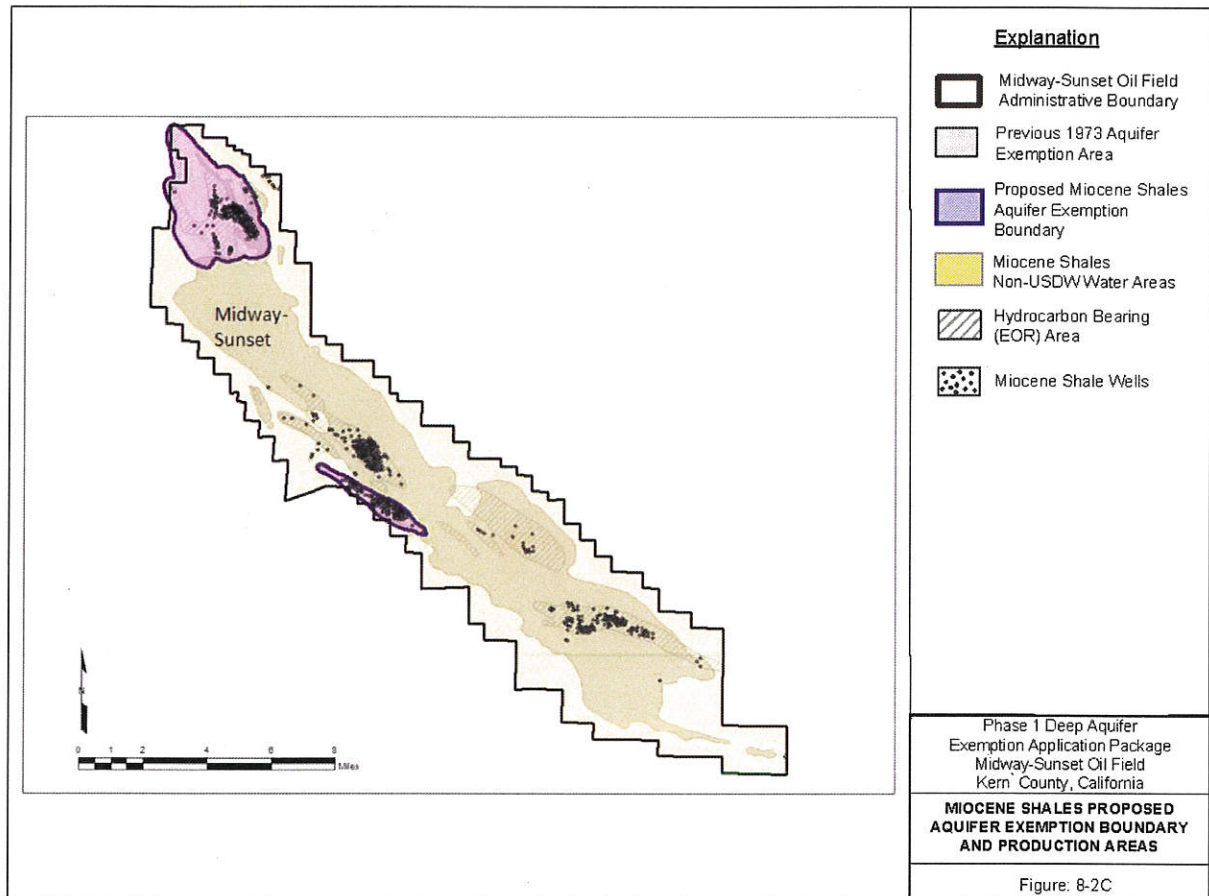
Figure 5



Cross-section A-B (Figure 7-6 of the revised figures), Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.



**Figure 6**



Proposed Miocene Shale Aquifer Exemption Boundary (Figure 8-2C of the revised figures),  
Aquifer Exemption Application, Midway-Sunset Oil Field, Kern County, California, May 25, 2018.